GE Medical Systems
Information Technologies

Setting Up the Dash® CapnoFlex LF CO2 Module

These instructions pertain to Dash 3000/4000 software versions 4 and previous.

WARNING
Route all tubing away from the patient's throat to avoid strangulation.

CAUTION
Do not use this module on patients that cannot tolerate the removal of 50 ml/min from their total minute ventilation.

The CO2 chapter of the Dash patient monitor operator manual has additional safety information and details on the CO2 menu options. Keep these setup instructions with the manual.

Dash Patient Monitor and Dash CapnoFlex LF CO2 Module

1. Plug the module into the CO2 connector on the patient monitor. The message *WARMING UP* is displayed.
2. Follow the steps below based on the message you see after the module is warm.
   CAL SENSOR TO ZERO CELL
   a. Connect the cannula to the module but not to the patient.
   b. Enter the CO2 menu.
   c. Select *CAL SENSOR TO ZERO CELL*.
   d. Select *READY*.
      The message *CALIBRATING* is displayed.
   e. Wait for the message to clear then connect the cannula to the patient. (Refer to the instructions that come with the cannula.)
   CHECK ADAPTER ADAPTER CAL
   a. The module is ready to use.
   b. Connect the cannula to the module and to the patient.
3. Patient monitoring of CO2 begins. Refer to the CO2 chapter of the Dash patient monitor operator's manual for details about monitoring this parameter.

Troubleshooting

Message	Problem	Solution
CHECK ADAPTER ADAPTER CAL	■ The cannula is not connected. ■ The cannula is blocked. ■ The module was calibrated without the cannula connected.	■ Connect the cannula to the module. ■ Replace the cannula. ■ Connect the cannula to the module and calibrate.

Refer to the module's service manual for additional troubleshooting information.

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DASH CapnoFlex LF CO_2 Module

Service Instructions

Software Version A

2000966-233 Revision A

GE Medical Systems
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NOTE: Due to continuing product innovation, specifications in this manual are subject to change without notice.

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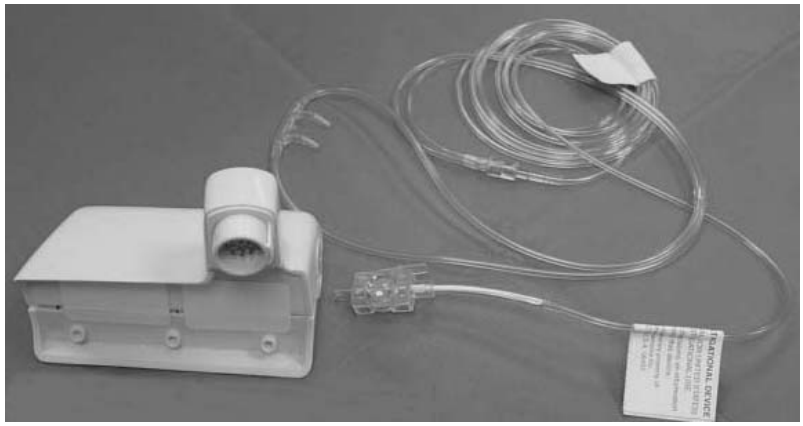
Description

The DASH CapnoFlex LF CO_2 module, hereafter referred to as the module, connects to the CO_2 connector of the DASH patient monitor and provides CO2 monitoring for intubated and non-intubated patients. The module operates at a low flow rate to allow monitoring of adult and neonatal patients.



There are no controls or indicators on the module.

The module is compatible with all available versions of DASH software that have the CO_2 function enabled.

NOTE

Please refer to the appropriate DASH patient monitor service manual for more detailed information.

The module is attached to a retainer clip that is affixed to the DASH with double-sided adhesive. Instructions for affixing the retainer clip are shipped with the module.

Technical Specifications

Manufacturer	Respironics Novametrix, Inc.
Displayed Information	Inspired and expired CO2 concentration Respiration rate (BPM) CO2 capnograph
Measurement Method	Diverting (LoFlo) infrared absorption (dual wavelength ratiometric)
CO2 Measurement	Units: Millimeters of mercury (mmHg) Range: 0 to 100 mmHg Accuracy: 0 – 40 mmHg - ±2 mmHg 41 – 70 mmHg - ±5% of actual 71 – 100 mmHg - ±8% of actual All specifications ±12% of actual from 80 to 150 BrPM Rise Time: <200 milliseconds System Response Time: <3 seconds
Interference	Device accuracy not affected due to the effects of interference by N2O, O2, water vapor, and concentrations of no more than 5% of halogenated anesthetic agents.
Measurement Resolution	1 mmHg CO2
Averaging	CO2 averaging is user selectable from the following times: ■ Single breath ■ 10 seconds ■ 20 seconds
N2O Compensation	Configure for N2O from 0% to 40% or N2O > 40%.
O2 Compensation	Configured for O2 from 0% to 60% or O2 > 60%.
Barometric Pressure Compensation	The system automatically compensates for changes in barometric pressure over the atmospheric pressure range of 530 – 785 mmHg.
Warm-up Time	From connection of the module at room temperature it is 80 seconds maximum to initial CO2 indication, and 3 minutes to full operating specifications.
Patient Status Alarms	Upper and lower limits for inspired and expired CO2 user selectable at the host.
Respiration rate (BrPM)	Measurement units: Breaths per minute (BrPM) Range: 0 to 150 BrPM Accuracy: ±1 BrPM Resolution: 1 BrPM Averaging: Respiration rate averaging is user selectable from the following times: ■ Single breath ■ 10 seconds ■ 20 seconds

Diverting (LoFlo) Sampling System	Flow rate: 50 ml/min ± 10 ml/min Response time: 5% CO2 step response 10 to 90% less than 200 milliseconds
Sample System Integrity	Acceptable leak rate is 2.4 in H2O/min. at 3 psi test pressure.
Power Requirements	Powered by host
Maximum power consumption (non-isolated)	2.5 Watts
Physical	Dimensions Weight: 6 ounces (<1 kilogram) Width: 4.0 inches (102 mm) Depth: 2.58 inches (65 mm)
Cooling Method	Natural convection
Heat Dissipation	Less than 2.5 watts
Temperature	Operating: 0° to 40° C (32° to 104° F) non-condensing Storage: -40° to 70° C (-40° to 158° F) non-condensing
Pressure and Altitude	Operating: -273.1 to 2,942.8 meters (-896 to 9,655 ft.) Storage: -609.6 to 4,572 meters (-2,000 to 15,000 ft.)
Audible Noise	<45 db

Theory of Operation

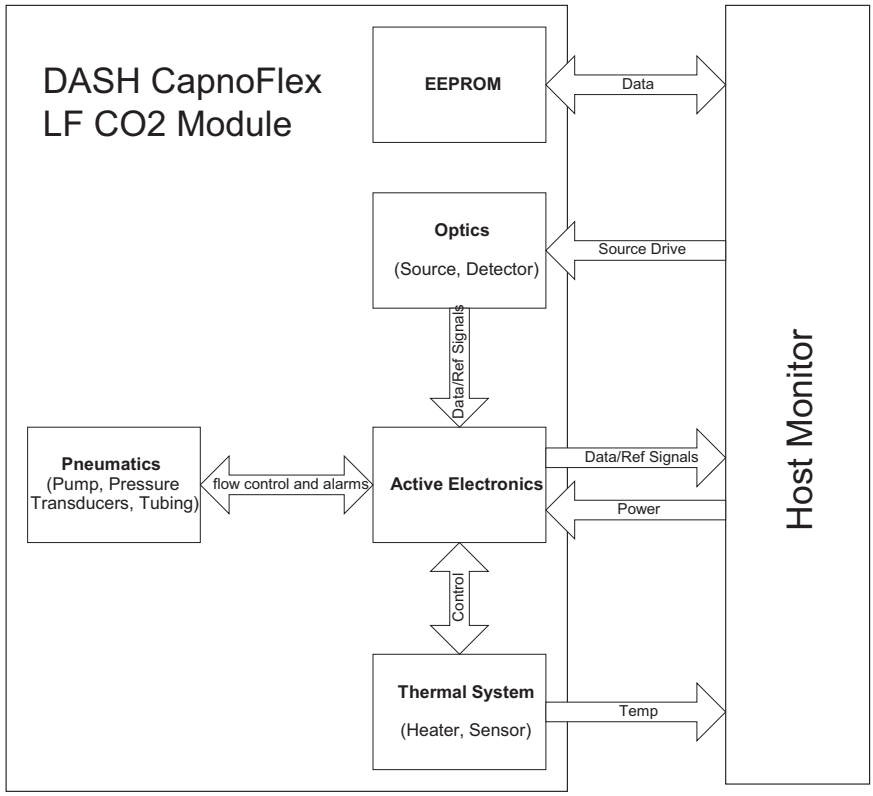
The module is designed to work specifically with the DASH 3000/4000 monitor. It is an infra red CO2 analyzer utilizing on the mainstream Capnostat technology. It contains a sampling pump for pulling a gas sample into the analyzer. It mounts to the side of the DASH and connects to the existing CO2 connector. The supporting electronics and software in the DASH common to both the main stream sensor and the DASH CapnoFlex LF module.

The sampling flow rate is fixed and internally regulated to 50 ± ml/min. A differential sensor pressure in the sampling circuit provides the signal for regulation. An occlusion can be detected by way of another pressure sensor constantly monitoring the pressure the sampling system for increased pressure. If the preset pressure is exceeded for 15 seconds the pump is turned off.

The inlet to the analyzer is mechanically unique and only accepts an approved sampling line containing the water protection trap. The sampling cell and water trap is integral to the disposable sampling assembly. A reflective optical sensor provides a signal for enabling the pump.

The analyzer has all calibration factors stored in an EEPROM. This allows for the use of the analyzer with any DASH as the calibration factors are read into the DASH each time a module is connected.

Below is a block diagram of the module.



Maintenance and Checkout

Manufacturer Recommendations

The manufacturer recommends the following:

- **Visual Inspection —** performed by service personnel upon receipt of the equipment, every 12 months thereafter.
- **Cleaning —** performed by service personnel upon receipt of the equipment, every 12 months thereafter.
- **Checkout Procedure —** performed by qualified service personnel every 12 months.

Manufacturer Responsibility

WARNING

Failure on the part of all responsible individuals, hospitals or institutions, employing the use of this device, to implement the recommended maintenance schedule may cause equipment failure and possible health hazards. The manufacturer does not, in any manner, assume the responsibility for performing the recommended maintenance schedule, unless an Equipment Maintenance Agreement exists. The sole responsibility rests with the individuals, hospitals, or institutions utilizing the device.

Visual Inspection

Inspect the module prior to installation and once every 12 months thereafter.

- Carefully inspect the equipment for physical damage to the case. Refer damaged equipment to qualified service personnel.
- Inspect all external connections for loose connectors. Refer damaged connectors to qualified service personnel.

Cleaning

Use one of the following approved solutions:

- cidex solution, or
- sodium hypochlorite bleach (diluted), or
- mild soap (diluted)
- lint-free cloth
- dust remover (compressed air)

To avoid damage to the equipment surfaces, *never* use the following cleaning agents:

- organic solvents,
- ammonia based solutions,
- acetone solution,
- alcohol based cleaning agents,
- betadine solution,
- a wax containing a cleaning substance, or
- abrasive cleaning agents.

1. Disconnect the module from the DASH.
2. Use a clean, lint-free cloth and one of the cleaning solutions listed above. Wring the excess solution from the cloth. Do not drip any liquid into open connectors.
3. Dry the surfaces with a clean cloth or paper towel.

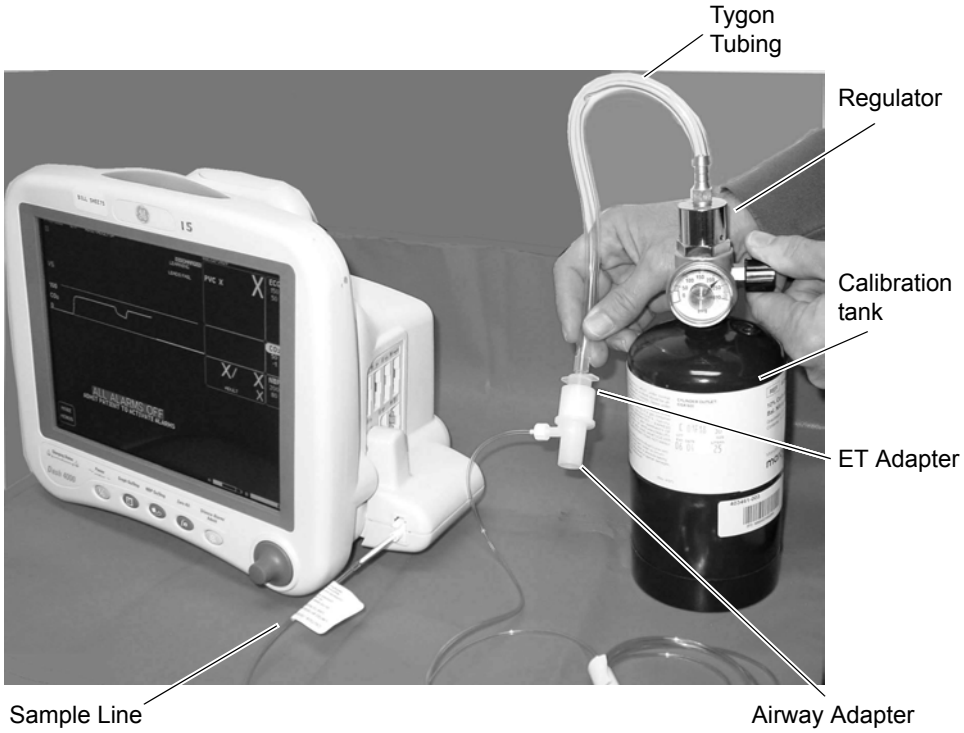
Module Accuracy Verification

The manufacturer suggests performing this procedure yearly. Use the CO_2 Module Calibration Kit, pn 405910-001 (or equivalent gas fixture with specifications shown below) to successfully complete this verification. See the How to Reach Us… pages at the beginning of this document to order the kit through Accessories and Supplies.

Calibration Gas Mixture	10% carbon dioxide, 25% oxygen, balance nitrogen Minimum accuracy: ±0.05%
Regulator	Approximately 1.5 liters per minute Must have CGA value of cylinder outlet
Tubing	Type: Tygon
Endotracheal Tube (ET) Adapter	Size dependent on airway adapter and tubing size
Airway Adapter	Use CapnoFlex LF Airway Adapter (see “Parts List” on page 12)

Test Setup

1. Attach the module with sample line to the DASH patient monitor.
2. Make sure the regulator is off by turning it clockwise.
3. Attach one end of the large tube to the calibration tank regulator and the other end to the calibration adapter. Do NOT connect the sample line to the adapter yet.



Note the Barometric Pressure

Barometric pressure is used to calculate the percentage of CO_2 in the patient's airway. To read the barometric pressure, access the *SERVICE MODE* menu starting from the MAIN menu.

1. Select *MORE MENUS -> MONITOR SETUP -> SERVICE MODE ->*
2. Enter password using the **Trim Knob** control to select the day and month from monitor screen with leading zeros. (e.g. July 4 = 0407)

NOTE

Check for the date in the upper left of the monitor screen.

MAIN MENU		REVIEW ERRORS	CALIBRATE	BATTERY SERVICE	PATIENT-MONITOR TYPE ADULT-ICU	
MENU SETUP	MONITOR SETTINGS		COPY UNIT DEFAULTS		GRAPH TEST PATTERN	TIME AND DATE

030B

3. Select *CALIBRATE*, then *CO2 SERVICE*.
4. From the *CO2 SERVICE* window, note the Barometric Pressure._____

Verify Accuracy

1. Return to *MORE MENUS* and select *CO2* to open the menu.
2. Select *UNITS*: and set to MMHg.
3. Select *CAL SENSOR TO ZERO CELL*, then select *READY*.

   The on-screen message reads *CALIBRATING.*
4. When the *CALIBRATING* message disappears, connect the sample line to the calibration adapter.
5. Turn on the tank regulator for several seconds, then turn it off.

   If the *NO BREATH DETECTED* message appears, simulate breathing by turning the regulator on for several seconds, then off for several seconds.
6. Read the EXP number. _____

   EXP mmHg = CO_2 value on tank X Barometric Pressure as noted above. Tolerance = ± 8%

If the module tolerance is outside the above range, return the module for repair.

Troubleshooting

The following table lists screen messages and other indications that there is a problem with the module. See "Parts List" on page 12 for item numbers and descriptions.

Message	Possible Cause/Solution
CHECK ADAPTER ADAPTER CAL	A failure in the CO_2 module board or a failure in the flow circuit. Check the flow circuit first. 1. Insert sample line. 2. Perform zero cell calibration. 3. Swap sample line with known good sample line. 4. Replace sample line. 5. Swap module with known good module. 6. Return module for repair.
WARMING UP	Allow device to warm-up for 1 minute. Check if sample line is properly installed. 1. Replace sample line. 2. Return module for repair.
CAL SENSOR TO ZERO CELL	Perform zero cell calibration. Check if sample line is properly installed. 1. Replace sample line. 2. Return module for repair.
CAL ERROR SENSOR	1. Replace sample line. 2. Return module for repair.
SERVICE CO2 SENSOR	Return module for repair.
SERVICE CO2 TEMP	Return module for repair.
CANNOT CALIBRATE	Module thinks it has detected a breath. Wait 2 minutes. 1. Perform zero cell calibration. 2. Return module for repair.
Other	**Possible Cause/Solution**
No CO2 parameter box	1. Check if module is attached. 2. Check if module is fully connected. 3. Swap module with known good module. 4. Return module for repair.
Incorrect CO2 Readings	1. Check if sample line is properly installed. 2. Replace sample line. 3. Return module for repair.
No Power	Check if DASH is on. Plug into AC power.

Parts List

See the How to Reach Us… page at the front of this document to order service parts. The table below lists the part item number and description.

Item Number	Item Description
2015023-001	DASH CAPNOFLEX LF CO2 MODULE
2013676-001	MOUNTING BKT DASH CAPNOFLEX LF CO2 MODULE
405910-001	KIT CO2 MODULE CALIBRATION
9504-016	GAS SCAVENGER 10FT TGB W/CPLG
2013066-001	CAPNOFLEX CO2 NASAL CANNULA - ADU
2013066-002	CAPNOFLEX CO2 NASAL CANNUAL - PED
2013066-003	CAPNOFLEX CO2 NASAL CANNULA - INF
2013066-004	CAPNOFLEX CO2 NASAL CANN W/ O2 - ADU
2013066-005	CAPNOFLEX CO2 NASAL CANN W/ O2 - PED
2013067-001	CAPNOFLEX CO2 ORAL/NASAL CANNULA - ADU
2013067-002	CAPNOFLEX CO2 ORAL/NASAL CANNULA - PED
2013067-003	CAPNOFLEX CO2 ORAL/NASAL CANN W/O2 - ADU
2013067-004	CAPNOFLEX CO2 ORAL/NASAL CANN W/O2 - PED
2013068-001	CAPNOFLEX LF AIRWAY ADAPTER - ADU/PED
2013068-003	CAPNOFLEX LF AIR ADPTR W/NAFION -ADU/PED
2013069-001	CAPNOFLEX LF SAMPLE LINE W/MALE LUER
2013069-002	CAPNOFLEX SMPL LN W/ MALE LUER & NAFION

Revision History

Each page of the document has the document part number and revision letter at the bottom of the page. The revision letter changes each time the document is updated.

Revision	Date	Comment
A	28 February 2003	Initial release.

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